RECEIVED

Pin Oak International, Inc.
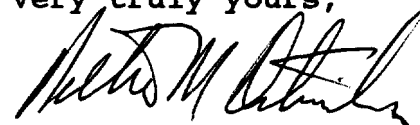
May 29, 1993

Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Dear Mr. Secretary:

Attached please find our submission in connection
with PR Docket No. 92-257 for filing with the
Commission.

If there is any further information you require,
please do not hesitate to call.

Very truly yours,

Peter M. Detwiler
President

Attachments

RECEIVED

JUN - 1 1993

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of

Amendment of the Commission's)
Rules Concerning Maritime) PR Docket No. 92-257
Communications)

To: The Commission

COMMENTS OF PIN OAK INTERNATIONAL, INC.

Respectfully submitted,

PIN OAK INTERNATIONAL, INC.

By: _____
President
2440 Larger Cross Road
Post Office Box 360
Gladstone, NJ 07934
Telephone: (908) 234-2020
Fax: (908) 234-9685

May 29, 1993

1

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This submission relates to Narrow Band Direct Printing Regulations (NBDP or Sitor) which have not kept pace with recent technological developments in NBDP communications. Such regulations badly need to be relaxed to foster more efficient use of frequency spectrum and to speed Marine data communications by factors of 4 to 10 fold or more with virtually error free transmission in the full ASCII character set. These transmissions would be an adjunct to Sitor and are completely accessible on the same equipment as Sitor. The computer recognizes the modality and answers accordingly. These transmissions use the same or less occupied bandwidth as Sitor, and when implemented would provide a very large saving in frequency spectrum due to their high rate of speed.

These techniques have been extensively developed in the Amateur Radio Service and are well proven. They are also being used by such organizations as the United Nations, the

Using new technologies, Private Coast Stations should be used in many instances for repeated same point links where the cost of public coast stations with their worldwide data network would effectively prohibit such communications entirely.

The writer, President of a company owning two vessels with NBDP capabilities and an office located Private Coast Station, speaks from more than 50 years of experience as an offshore skipper of small to medium sized boats and as an amateur radio licensee for more than 30 years with over 20 years experience in digital modes.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of

Amendment of the Commission's	)
Rules Concerning Maritime	) PR Docket No. 92-257
Communications	)

To: The Commission

COMMENTS OF PIN OAK INTERNATIONAL, INC.

Pin Oak International, Inc. (Pin Oak), a Delaware corporation, pursuant to Section 1.415 of the rules and regulations of the Federal Communications Commission, files these comments in the above-captioned proceeding.

Pin Oak's Interest in this Proceeding

1. Pin Oak owns two U.S. documented non-commercial vessels, "All Is Best", Callsign WUV6823, (Selcall 11583), an 82 ton, 70' ketch designed to cruise worldwide; and "Gammoner", Callsign WAN7775, (Selcall 11077), an 18 ton 36' Grand Banks Trawler yacht designed for coastal cruising and limited safe offshore cruising. Such cruising is highly weather dependent, and the vessel's communications system must be able to receive precise weather forecasts customized to its passage from a private marine weather forecasting service. This is an increasingly common practice

particularly as forecasting is generally quite accurate on a custom specific position basis. The weakest link in such a system is the actual delivery of the forecast to the vessel and the cost of delivery which can exceed the cost of the forecast.

2. The Company also operates a Private Coast Station at its office WHF814, (Selcall 1117). The Private Coast Station FCC license permits both radio telephone (SSB) communication between the office and its vessels, as well as Narrow Band Direct Printing (herein after referred to as NBDP or Sitor). Phone does not afford a sufficiently practical and reliable means of communication, and data communications via SITOR (CCIR-476 and CCIR-625) is used exclusively for these vessels' communications. In addition, Pin Oak uses Public Coast Radio Telex Stations such as WLO and WCC. Communications carried on Pin Oak's Private Coast Station are too costly to be sent at $2.43 per minute at 50 baud on a worldwide telex network. Nevertheless, Pin Oak actively uses WLO particularly to receive the daily Associated Press News Reports and the NOAA Offshore Forecasts (of modest use due to the enormous geographic areas covered by the condensed forecasts) as well as multi-point conventional telex traffic. This service while slow is essential.

3. Smaller vessels such as those owned by Pin Oak cannot operate effectively with high gain directional

antennas with high powered, high frequency phone (SSB)
transmitters due to the limited physical separation of
antennas and electrical equipment afforded on a smaller
vessel. Such vessels are frequently made of fiberglass
rather than steel, thus presenting a less desirable "ground
plane". Due to the closeness of all antennas whether they
be for Radar, navigational or the other communications
systems and the proximity of the ship's entire electrical
system, the use of much power is impractical as it will
saturate these devices and in some cases render them
temporarily useless. As a practical matter only 100 to 150
watts of transmitter output is used due to the restraints
mentioned above. With this level of power and say a 23 foot
omni-directional whip, pulsed data is the only useful method
for day in day out reliable communications. In fact the SSB
radio is seldom used by Pin Oak for Ship to Shore
communications. Nevertheless, the SSB radio, when used as a
NBDP radio, really shines; and such an installation will
afford a vessel highly reliable text communications on a
worldwide basis at an affordable incremental cost. Almost
all such vessels as Pin Oak's have a high frequency single
sideband radio capable in most cases of handling pulsed
data. The basic problem is that with the present protocols
(CCIR 476 and 625), the data rate with such equipment is
"painfully slow" and error prone, but this is not necessary
nor is it an efficient use of spectrum. Further,

7

communications by data if improved could replace much voice
communication on HF.

4. Due to vessel space limitations, high incremental
equipment costs and expensive air time, satellite stations
are not susceptible to usage on smaller vessels. On the
other hand, such vessels generally have a Marine SSB radio
running at lower power and now require only a few hundred
dollars of expenditure to link their radio and lap top
computer together to provide worldwide communications.
These vessels can travel worldwide and increasingly
regularly do so.

5. A vessel of 82 tons might easily have 10 to 14
persons aboard. An 18 ton vessel might have 4 to 5 persons
aboard. Such vessels, when beyond, say, 30 miles from shore
(VHF range) have little means of reliable communication as
opposed to larger vessels. This is true notwithstanding the
fact that such vessels frequently have data capable radios,
lap top computers and need only some modern technology and
an interface device between the radio and the computer to
give them reliable communications. Pin Oak's vessels are
typical of tens of thousands of such vessels in this regard
including similarly sized commercial vessels such as fishing
vessels.

6. The Marine industry, while large, is very defuse
both in terms of users and manufacturers. Accordingly, it
is probably not as vocal or as informed about modern

communications technology as other groups, say aviation, for instance. Where there has been a strong promotional effort by manufacturers to sell a new technology such as the new Global Positioning System, this has resulted in most smaller vessels becoming very rapidly equipped in the last year.

7. The historical very slow data rate protocol presently permitted in Sitor, poor error correction and historical high cost and complexity of this data communication's older software has effectively disenfranchised this group from reliable offshore communications. Vessels of, say, 100 feet and up practically use satellite communications. Smaller vessels, the majority, are left with technology 20 years old and difficult to use software, and hence communications and margin of safety are impaired.

8. The existing FCC rules for data communication have changed only slowly while data technology in the last few years has been changing on a yearly if not monthly basis. There is an explosion in knowledge occurring in high frequency data communications now perhaps similar to that time in 1902 when Marconi began sending trans-Atlantic traffic. This resulted in mandatory equipping of many vessels after the Titanic's sinking with radio and the establishment of SOLAS.

technologies are common place. In our office 4 years ago we bought 2,400 baud telephone modems; now we have 14.4 kilo baud and these will soon be outmoded (28.8 upgrade has just been announced). The same thing is happening in the field of high frequency communications, and the rule making process should foster the use of such methods <u>as an adjunct to not as a replacement for Sitor, just as new forms of communications have been an adjunct to CW - the earliest form of data communications.</u>

10. Accordingly, Pin Oak as a Marine radio

11. The writer grew up sailing, racing and cruising offshore for approximately 50 years of his 65 years of life. Also, he has been an active amateur radio operator for more than 30 years. In addition, he has been very active in the field of amateur digital communications for the last 20 years, and for the last 5 years very active in the field of digital Marine communications as an active offshore cruising skipper.

12. Up until two years ago, amateurs used Amtor (generally identical to Sitor) for reliable worldwide communications. This mode provides a very slow data throughput due to its low data rate, high overhead in software and poor error correction. Throughputs of 50 baud are optimal and 35 baud are typical. Even on good high frequency links with a 10 to 20 kw Shore Station, several errors on a page which slip through the low level error correction are typical. Nevertheless for its time Amtor was considered a very advanced technology -- that is until someone thought of something better. Five years ago a group of German amateurs began developing a new technology called Pactor. The hardware began to be available several years ago. Pactor has a data throughput of between 100 and 200 baud (4 times that of Sitor) and has a level of error correction that is so high that in 1 1/2 years of use, this writer has not observed an uncorrected transmission error. Compressed animated color pictures can be sent in Pactor

rapidly by high frequency radio. In the last 6 months a
U.S. technology called Clover has been introduced which can
provide data throughput of up to 600 baud (10 times that of
Sitor) before data compression and perhaps double that with
the use of data compression. In other words, Pactor is 4
times faster than Sitor, does not make mistakes and occupies
the same occupied bandwidth; it uses data compression and
can be used interchangeably with Sitor/Amtor. It further
uses the full ASCII 256 character set compared to Sitor's
less than 60. The TNC is available as a computer circuit
board for around $200.00. Clover performs the tasks faster
still but costs more -- $995. These new technologies are
highly susceptible to automation and are "user friendly".

is in place still and operating reliably. In 1990,
"Gammoner" was acquired and more up-to-date Sitor equipment
was installed on it then costing 50% less. That same
equipment would cost $3,000 now if the vessel did not have a
data ready (most are) radio (SSB) and about $1,000 if a data
ready radio was already on board (the typical case).

15. The writer spends several months of the year on
"Gammoner". This requires communications with Pin Oak's
office, and in 1990 Pin Oak obtained a Private Coast Station
license for communications with its vessels due to the
prohibitively high cost of such traffic on public coast
stations and the need for a one to one link rather than a
worldwide communications system. The protocols, equipment
and procedures in May of 1993 are virtually identical on the
two vessels to what they were five years ago in 1988. The
rules provide no other HF option.

Amateur Communications Activities

16. For over 30 years, the writer has operated amateur
radio station WA2MFY in Gladstone, New Jersey. Many years
ago this station was Phone and CW. In 1972 Mechanical
Digital Equipment began to be used. A few years ago the
writer began operating an Amtor (same as Sitor) amateur
radio worldwide "mailbox". This mailbox fosters
technological exchanges in digital communication between its

13

registered users as well as personal message traffic. It is

not intended to handle third party traffic (Aplink). Then 1

traffic will run 2,400 pages up from 1,200 in April and a
few hundred pages before. The system as it stands could run
a Marine communications facility quite easily using Marine
Type Approved Radio equipment at an enormous saving in
frequency spectrum and equipment cost. The transmitters are
the same as before running in Amtor, and continue to run in
FSK as before. Only the TNC is different. It now costs less
than $300.00.

18. Shortly a Clover node will be put on line
(System/3) and will run in full compatibility with Amtor and
Pactor also scanning yet another set of 15 frequencies on a
third Antenna System at 100 watts. Clover has Adoptive
Power Control so that it only runs the power the link needs
for acceptable traffic flow. With Clover, data compression
speeds of over 1200 baud might be expected.

19. The WA2MFY mailbox system runs virtually problem
free. It has come of age just like the fast 14.4 kilo baud
(now 28.8 KB) telephone modem has.

20. What has happened here is that many have learned
how to process the complex problems caused by transmission
of data through a non homogeneous medium, the ionosphere.
Cheap but powerful TNC's, software, and small computers have
been able to unscramble these signals at an ever faster
rate. Signals can be detected and processed that are below
the noise level with this new equipment. Development will
not stop here. Pactor II is in the works for next year.

Clover is just getting started. In other words there has been more than a 10 fold increase in data rate in two years alone at no detriment to the frequency spectrum, but rather at a tremendous saving in air time for the same traffic -- up to 90% saving.

21. The software being recent is now easy to use. It does not require a Ship's Radio Officer to master it. Most amateurs do so in a few hours. The system for smaller vessels is now available and, of course, can serve as an alternate to Satellite Communication systems for larger vessels.

Technical Considerations

22. <u>Bandwidth</u>: The new Narrow Band technologies operate in the same or less occupied bandwidth than Sitor. In most cases the same radio equipment can be used as before. In fact the occupied bandwidth of Pactor at 200 baud is similar to Sitor at 50 baud.

23. <u>"Data Rate"</u>: This as a regulatory matter considers each symbol sent as if it were a letter. This effectively may prohibit data compression -- commonly used in all fields of communication. The stated baud rate of 200 baud in Pactor does not occupy more bandwidth than conventional Sitor. Sitor has a data throughput rate of 50 baud, before error correction. Pactor has an average

observed data throughput rate (using Huffman data compression) of 200 baud before error correction. Clover will have a baud rate of up to 600 baud but at a low symbol rate due to completely new techniques, <u>before data compression</u>. This could increase to <u>more than 1200 baud</u> with say PKZIP data compression.

24. <u>ASCII Character Set</u>: The use of the full ASCII 256 character set enables the sending of messages with the "complete set" of characters that computers use to talk to each other. Sitor uses a small character set of about 60 characters, nearly half of which depends on the reliability of receiving the Up shift/Down shift commands, a major weakness, when viewed in connection with poor error correction. For instance, it is common in Sitor to get letters instead of numbers (upshift command misread) or numbers instead of letters (downshift command misread). In the case of weather forecasts, financial communications with tabular numbers and lists of radio frequencies all of which must be exact to be meaningful, it may require the download of the same text file in Sitor three times to get a "for sure copy", Thus the baud rate may drop to 10-20 baud "error corrected". The historical "fix" for this problem has been to run 5 to 30 kilo watts at the Shore Station. Even this does not always work.

25. Sitor's code patterned after the Baudot code invented in the 19th century is a major limiting factor to

17

any growth because software as we know it cannot be readily used. Thus technological development has been stifled in part through this code and its poor error correction.

26. The language of Personal Computers is ASCII, and it has a recognized format since 1968. ASCII's international counterpart was accepted in 1973.

27. <u>Overhead</u>: The overhead of Sitor is very high due to the packets being short (210 ms. for only 3 characters) versus a relatively long control signal (70 ms.) and a long window for each 3 character packet to be sent (450 ms.). Thus only 3 characters are sent before error correction in nearly 1/2 second. However good Sitor was many years ago, it can now be considered "antique" but nevertheless an accepted standard to which faster adjuncts can be added. The computer has no trouble with this concept at all.

28. Longer packets relative to short control signals mean less overhead or waste time. Internal error correction where the packets can correct their own errors without total repetition and data compression further serve to increase the data rate with less wasted time. Pactor uses 960 ms. packets (192 [96] bits at 200 [100] baud), with a control signal of 120 ms. and a window of 1250 ms. (See Exhibit A attached.)

29. Clover uses longer packets up to approximately 20 seconds long and 4 tones instead of 2. Its "base modulation" rate .... is always 31.25 symbols/sec. Data

throughput rates before data compression can exceed 600 baud and perhaps 1200 baud after compression. (See Exhibit B attached.)

30.   Clover is classed as a CCIR Emission 500H J2 DEN or 500H J2 BEN.

31.   Clover operates completely interchangeably with Amtor (Sitor) and Pactor on the same communication system. A user can access any of these 3 modes on a single frequency and automatically receive a response in the correct mode.
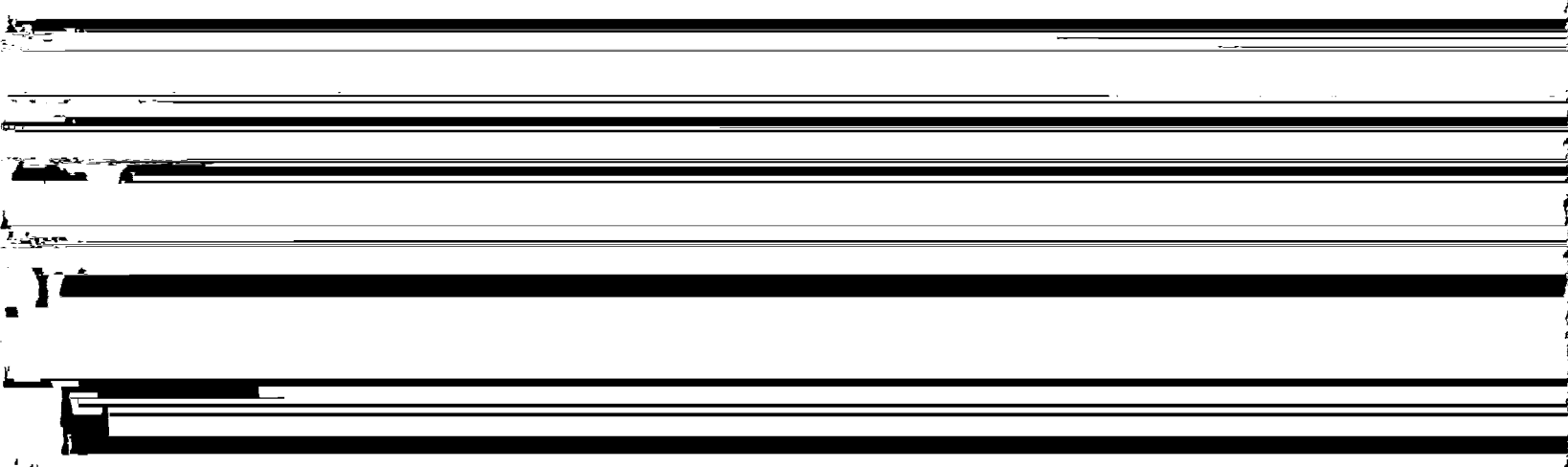
32.   Error Correction: The Baudot code provides such a low level of error correction that numerous texts have to be repeated in their entirety to be intelligible. This is very troublesome where numbers are sent and errors can be fatal.

languages are all publicly available except for "ciphers" which are completely different in that their intent is to obfuscate the meaning. Sending complete disks in Word Perfect language or ASCII by mail and other means is common place now. Not to use these recognized computer languages on High Frequencies is like going back to using slide rules rather than modern calculators for scientific and business calculations. (Note: In 1951 the first class attended at the Harvard Business School by this writer was how to read and use a slide rule. All students now are expected to use PC's just like slide rules of 40 years ago.)

35. **Interference**: Higher data throughput technologies operate in the same occupied bandwidth that Sitor does -- 500 hz. or less. Thus 3 - 4 HF radio data channels might replace one radio telephone channel.

Regulatory Aspects

36. The writer believes it to be in the best interests of the Marine community to relieve it of certain burdensome rules which restrict the use of modern technology and are a holdover from other times and circumstances. This can be

<u>For Private Coast Stations</u>:

A. In FCC 92-257 paragraph 21, comments are solicited on private coast stations... in VHF. This area of inquiry should be broadened to HF now with new technology permitting greater safety at sea through one on one low power links which do not require a high power worldwide "go anywhere" communications system. This can be done through Private Coast Stations in many cases on a "non-interference" basis. The range of frequencies available to such stations should be broadened to include frequencies above 8 Mhz to have reliable round the clock communications. That appears not to be the case at the moment, and Private Coast Stations are relegated to essentially night time communications due to frequencies allowed versus propagation realities except over short distance -- 500 nm.

B. Allow U.S. licensed Private Coast Stations to use advanced protocols, but in addition and not to the exclusion of Sitor. My information is that this is already happening in Europe on "an informal" regulatory basis. Relaxed regulations would foster efficient spectrum usage. No one would intentionally use a slow communications system.

<u>General</u>:

A. Remove the Sitor only restriction for Marine communications. Change it to Sitor and a general definition

21

encompassing other new technological principles and techniques.

B. Relax present restrictions to allow other codes as described above as additional permitted methods.

C. Allow data compression as long as it is regularly available even though it may have to be purchased (like a copy of Word Perfect).

D. Expand the 100 baud level to 200 baud as long as the occupied bandwidth does not change.

E. Use symbol rates as a regulatory tool not baud rates so as to encourage spectrum efficient techniques.

F. Generally make the availability of NBDP licenses easier to obtain from the FCC. Since they are spectrum efficient, they should be encouraged rather than HF phone licenses which are routinely granted. NBDP requires an additional application. There are plenty of selcalls available now and technologies such as Pactor and Clover just use the Callsign to connect, not a selcall.

37. This current probe by the FCC into Marine communications technology is most timely as it comes at a time of great technological change. Rules should be flexible now and encourage sound change. This knowledge can be put to work quite promptly with the result that spectrum is conserved, while the public is far better served.

BULL20 -- WA2MFY MAILBOX
======

THE WAA GROUP   APR/91

P A C T O R   Short system description

I.   Introduction

AMTOR and PACKET RADIO (PR) have become rather popular ARQ techniques in
Amateur Radio. Nevertheless, concerning poor-quality channels, their
performance is far from optimum. AMTOR, matched to old mechanical teletype

1. Timing

The basic PT transmission frame is very similar to AMTOR; blocks (packets) containing data information are acknowledged by short control signals (CS) sent out by the receiving station.
Shift levels are toggled with every cycle in order to support memory ARQ (see below). Since the shift polarity is clearly definined at synchronization time, any conventions concerning 'mark / space' become obsolete.

```
cycle duration : 1.25 sec
packets        : 0.96 sec = 192 (96) bits at 200 (100) baud
control signals: 0.12 sec = 12 bits, each 10 msec long
CS-receive gap : 0.29 sec
```

Change of transmission speed only alters the internal packet structure; all other timing parameters remain constant.

2. Packets

General packet structure:

/header/..20 (8) data bytes at 200 (100) baud../status/CRC/CRC/

header : This byte enables fast synchronization and delivers auxiliary information (memory ARQ, listen mode)
data   : arbitrary binary information
status : system control byte (2 bit packet number, tx-mode, break-in request, QRT)
CRC   : 16 bit cyclic redundancy check based on CCITT polynomial $X^{16}+x^{12}+x^5+1$, calculated over the entire packet (except header)

3. Control signals (CS)

Four CS are used. As a compromise between reliability and fast detection, a CS length of 12 bit was chosen.

CS1: 4D5   CS2: AB2   CS3: 34B   CS4: D2C   (all hex numbers, LSB right)

The mutual Hamming distance is 8 bit, thus minimizing the chance of receiving a false CS. CS1/2 and CS3/4 form symmetrical pairs (bitreverse patterns).
CS1..3 have the same function as their AMTOR counterparts; CS4 serves as the speedchange control. In contrast to AMTOR, CS3 is transmitted as head portion of a special changeover packet (see below).

4. Starting a PACTOR contact

The calling station ('master') sends special synchronization packets:

/head (100 bd)/..address (8 bytes, 100 bd)../..address (8bytes, 100 bd)/

24